THE ARCHITECTURAL ELEMENT IN ENGINEERING WORKS.

By H. Heathcote Statham [*F.*].

Read before the Royal Institute of British Architects, Monday, 15th May 1899.

I HOPE no member of this Institute supposes for a moment that this paper, although a comment on engineering works from an architect's point of view, is intended in any sense as an attack on the engineering profession. So far from entertaining any such intention, or having any feelings which could prompt me to it, it seems to me that in the century which is just drawing to a close engineers have played a far more important part in the world than architects. This is partly, no doubt, owing to circumstances not altogether within their own control, but which they have turned to splendid account. The enormous development of locomotion by means of steam power, which will be remembered in history as the great characteristic of the present century, has led to a demand for immense constructional works all over the world for the crossing of rivers, valleys, and estuaries—not to speak of the variety of other works unconnected with the railway system, some of them (such as reservoirs) on a very large scale—which has furnished the engineering profession with opportunities such as the profession ("or art"—*infandum renovare dolorem*) of architecture has not enjoyed since the era when the mediæval cathedrals were built. The viaduct, we may say, is to the nineteenth century what the cathedral was to the twelfth, thirteenth, and fourteenth centuries. The public want great engineering works, and are willing to pay liberally for them. They do not want great architectural works at present—they do not, in fact, want architecture at all; and if there are circumstances in which it is to some extent forced upon them, they at all events grudge paying for it, and try to scamp it as much as possible. Moreover, the engineers have one great advantage over us, that in regard to everything within the proper limits of their own profession (I use that phrase advisedly) they know exactly what they want, and I am afraid it must be admitted that we do not; at least, if we are all agreed that we want to produce artistic beauty in building, we are by no means agreed as to the best path to pursue towards that desired end. But I do not believe this is altogether our own fault. What is at the bottom of it is that there is no great public want or ambition for great architecture to pull us along. As Lord Leighton said, speaking at the Liverpool Art Congress, "What the public want, that they will have." During the greater part of this century the public have wanted great works in engineering, and the want has evolved great engineers. There may be a change, a reaction from this phase, perhaps before very long. The engineers may possibly even now be getting near the end of their tether. But, at all events, if a time arrives again when the mass of the people really want and long after great architecture as a possession to be coveted and prized, there will then again be great architects and a great style of architecture.

It has been argued by some people of late that in fact the professions of architecture

and engineering are the same thing, that they never ought to have been disunited, and that they never were until modern times; that the object of each is construction of some kind, and that all construction, besides being sound and scientific, ought to be beautiful as far as it can be made so. There is a certain truth in this, but it must not be pushed too far, either in regard to present circumstances or past history. It may be admitted that there are a good many cases in which you cannot draw the line very easily between architecture and engineering, in which the work might be classed in either category, and might be carried out by either an architect or an engineer. There are, for example, the smaller class of bridges for ordinary traffic, and which do not involve large operations on specially constructed foundations in the bed of a river, such as need the special training and experience which engineers have had in that sort of work. There is no reason why a bridge of that kind should not be built by an architect just as well, in regard to practical construction, as by an engineer; in fact, I have put up on the screen here an illustration of a small stone bridge designed by Mr. Ernest George, and which some of you may have already seen; a charming work in an architectural sense, and which presents nothing in its construction out of the way of an architect's knowledge and experience. I draw a distinction, even in regard to small works, between bridges for common use and those for railway traffic, because, in regard to the latter, there are special questions to be considered in regard to the formation of the roadway, the weight of trains, and the effect of impact of a rapidly moving load, &c., which are outside an architect's experience. But when we get away from this border line occupied by works which might be classed in either category, we come, in opposite directions, to works which have an essential distinction, and which may be classed respectively as purely architectural or purely engineering. The distinction may be defined thus: architectural works are those in which, though they may be based on utilitarian requirements (as in fact every building is, except monuments or triumphal arches), the consideration of architectural effect and artistic expression is an important element. Engineering works are those in which considerations of structural fitness and economy of material are obviously and necessarily paramount, and in which, in many cases at all events, decorative treatment would seem an impertinence (in the Latin sense of the word) and out of place. As examples on the one side we may place a church, a mansion, a town hall; on the other side such a structure as a large railway viaduct.

The question of economy of material, just touched upon, has a good deal to do with the distinction. Architecture in her highest efforts, it may be said, disdains economy of material; one of the elements of monumental expression, in fact, consists in redundance of material—the highest architectural effect is hardly to be realised without it. Pure engineering, on the other hand, aims at economy of material, not only because, in the case of railway companies, the dividends have to be considered, but also because, in works on a large scale, the main problem is to secure the greatest strength with the least weight; the weight of the material itself, in bridging a great span, being the greatest difficulty to contend with. In the Forth Bridge, for example, the weight of the train is almost a trivial matter; the business was to make the structure carry its own weight; that once done, the train is a mere fly upon the wheel, so to speak. In such a structure every pound of material that is not doing work is, *pro tanto*, matter in the wrong place. And that is really, perhaps, one of the most important of the distinctions between engineering and architecture. An architect loves mass and weight of material for its own sake, for its effect in giving monumental character; an engineer, when confining himself to pure engineering, wants no material that is not necessary for structural stability.

As to the historic view of the matter, the assertion that the division of builders into

architects and engineers is only a modern one, that also seems to be an exaggeration. In the Renaissance period, it is true, one man did all kinds of things, and we find a great painter acting as military engineer, devising instruments of war, and planning fortifications. But it does not seem to have been so with the Romans. Roman architects could not do without the column and entablature, even where it was used only as a decoration in a construction essentially arched. The man who designed the Colosseum stuck orders in parallel ranges all over it, and would certainly not have been satisfied without them; nor probably would his public have been satisfied—they would have thought their great theatre had a mean appearance. But this was not the case with those purely utilitarian works, the aqueducts. There they dispensed with the otherwise universal columnar order; the aqueducts were merely tiers of arched construction, with perhaps a plain impost moulding. Their weather-worn remains look picturesque to us now, but they were not picturesque to the men who built them; they had, I feel certain, no more sentiment about such a structure than a modern engineer has about a lattice girder. It was the best practical method in those days of carrying a high-level water conduit, and was probably carried out by a different set of men from those who designed the temples and theatres.

Engineering works properly so called, therefore, are those in which structural and practical requirements alone are taken into account, without any special consideration of æsthetics or any special effort at what may be called architectural effect. An immense number of such structures have been erected all over the civilised world during the present century, and many persons, artists especially, have been either mournful or indignant over this, and have complained that the world is getting covered with structures which have no beauty. I have not much sympathy with this constant depreciation of engineers and their works, and consider it to be very much exaggerated. What I think is the real mistake of modern engineers is a point I am coming to presently. But in regard to a large proportion of the purely utilitarian structures which have been erected by engineers, I hold that there is a great deal more of interest in them than many of those who complain of them are able to perceive. That the intellectual interest of works of pure architecture is of a higher kind than belongs to anything connected with mere engineering I should certainly maintain. But structure is in itself a subject of great interest, and those who can find nothing to admire in a great piece of construction devised to overcome a practical obstacle to intercommunication or locomotion give evidence not so much of a superior as of a one-sided education. We hear about railways spoiling the country; in fact, if we are to believe Ruskin, the railway system is the curse of modern life, the destroyer of scenery, and so on. No doubt a railway in process of making causes a temporary disfigurement to the neighbourhood; so does the formation of a new street. But after it is once completed, the cases in which it has really spoiled the landscape are not, at all events, very numerous. In fact, it may often be said to have added a new element of the picturesque, a new interest in the scene, so long as the structures connected with it are frankly and simply designed to meet the practical necessities of the case. In a general way, it may be said that it is the attempt to make them "ornamental," in the popular sense of the word, which spoils them. A locomotive engine of the highest class, a giant of power and speed, yet finished, as Robert Stephenson said, "like a watch," is to my mind one of the most stately and impressive objects ever produced by human hands. Would it be improved in appearance or in effectiveness by anything in the shape of what is generally called "ornamental" treatment—by scrolls or floral ornaments worked upon it, for instance? Any such bedizenment, foreign to its practical purpose, would only interfere with the impressiveness derived from its fitness for its great tasks.

Then in regard to statical structures, it may be said that you can hardly design a

structure to overcome a great natural obstacle, or to resist one of the great forces of nature, without giving it a certain character, an interest of its own, provided it is carried out in a simple and unaffected manner, and with direct reference to its practical purpose. You cannot build a stone bridge across a river without producing a fine object in the sweep of the arch and the resisting mass of the abutments. A suspension bridge, again, with the catenary curve of the chains designed for us, as it were, by nature herself, is so beautiful an object that it is exceedingly difficult to spoil it; engineers have succeeded in spoiling it in some cases, as I shall have occasion to show, but it is because they will not always be content to let it alone sufficiently. But the girder—the box girder and lattice girder? Certainly they have not the same beauty of line as the arch or the chain; and, moreover, when it comes to the case of a bridge for ordinary traffic, and especially in connection with the architecture of a city, every architect must feel that the introduction of iron construction interferes with the monumental character of the structure, and is more or less a discordant element in relation to the surrounding architecture. The case of a railway bridge is somewhat different. Here, where the span to be bridged is a large one, the steel girder is redeemed in our eyes, or should be, by its obvious practical suitability to its purpose. A stone-arched viaduct over land, with comparatively narrow arches, is satisfactory to our sense of structure, and may be, and often is, a very fine object; but a stone bridge of wide span, and with an arch necessarily very flat at the crown, would not give the same sense of security under the rush of a heavy train, besides costing much more to build—the question of dividends again coming in. It is absurd, therefore, to blame engineers, as if they were enemies of the human race, for erecting a girder railway bridge in a situation where, as people say, it spoils the scenery; if the span is a long one they would hardly be doing their duty either to their clients or to the public by adopting any other form of construction. The most serious drawback to iron structures, considered in their relation to scenery, consists in the necessity for painting them. In stone you have a natural material which harmonises with the landscape; in brick you have a material which takes on tints from weather and, therefore, ultimately harmonises; in the case of iron you are reduced to the paint-pot. In regard to considerations of form, a clever engineer observed to me that people were satisfied with stone or timber construction, in an æsthetic sense, because the treatment of the materials, and the manner of making connections in timber work, were familiar to them, and consequently had a kind of old association attached to them; and that when the public had become equally familiar with the sight of iron construction and its methods, they would have a similar association with it, and would cease to regard it as intruding on and spoiling the landscape. There is something in that, I think; it is an idea worth consideration, at all events. Still, as I said to him at the time, that does not get rid of the crude effect of the paint, which has to be over and over again renewed.

Apart from these considerations, the girdo-phobia, as we may call it, of many artists and persons of æsthetic sensitiveness seems to be exaggerated. A girder bridge is certainly not so pleasing in its lines as an arch or a suspension chain; but, after all, it is only a beam on a large scale; the most perfect style of architecture in the world deals with beams or lintels, and has no arched forms; and the girder is a large and specially constructed lintel or beam, according to the way in which it is used. I will read you just now, when we have the illustration before us, what one of the most eminent and thoughtful art-critics of modern times said of one celebrated example of a box-girder bridge. But in all these cases simplicity of design, absence of anything like pretentiousness, a simple definition of the practical lines of the structure, are the conditions under which it will have the best effect. If a structure of this kind is let well alone, simply treated as a piece of unadorned construction, it will in a sense make its own æsthetic. I saw a good example of this in some of the illustrations to a history

of the Intercolonial Railway in Canada, by its engineer; a line about a thousand miles long, most of which was surveyed and laid out, in the first instance, through uncleared forest. In spite of the abundance of timber along the route, the engineer decided against wooden bridges, in view of the frequent cases, on American and Canadian railways, of their destruction by fire. Across a good many of the minor valleys or hollows the line was carried on lattice-girder bridges supported on simple rectangular pyramids of undressed stones, rather wider at the top than the width of the girder, and without any "treatment" of any kind, the girders being just laid across the tops of these stone piles. These really looked quite picturesque; it was the Dartmoor rustic bridge on a large scale. They certainly looked far more in keeping with the landscape than if they had been carried on and bolted to iron columns; and, in fact, one of the principal drawbacks to the appearance of iron railway bridges in many cases is the tenuity of the supports. The real necessity for the iron is in what we may call the beam portion of the work; if the piers can be made of stone or granite, so as to give mass and breadth to the supports, half the architectural objection to the iron girder bridge is done away with.

We will now go through a few examples of engineering works in which there is little or no attempt at anything more than the simple construction. Most of these will be bridges, partly from the necessity of the case, for it is not easy to get lantern views of any engineering works except bridges. Engineering works are not photographed for lantern purposes as a rule, because the public do not care about illustrations of them; but there seems to be an exception in favour of bridges, which are regarded as objects possessing a certain degree of picturesque interest. But inasmuch as this Paper arose mainly out of the controversy which has taken place lately in regard to the new Vauxhall Bridge, it follows fortunately that the class of objects of which it is most easy to obtain illustrations are those which have the most direct bearing on the case. I have divided them into groups, commencing with a group consisting of what may be termed the trestle type of structure, in which the construction is formed with struts and ties, and dispenses with massed-up material in the way of built piers or abutments.

We may begin with an example of the most unsophisticated kind, that of the *Skeena* bridge in Canada, the work of native Indians. Absurdly naïve as this erection appears, it nevertheless contains a great type of engineering construction in embryo; it is a cantilever bridge, and is constructed on the same principle as the Forth Bridge, the cantilever portions, which are apparently anchored by being simply stuck into the ground on each bank, being projected from each side as far as was possible, and then connected by a central span slung between them. Hence it appears that the natural and unconventional instincts of man tend towards the use of the cantilever principle. The next example is a Japanese bridge, which, though it is a much more finished structure in appearance, and is picturesque enough, is nevertheless much less scientific in principle than the Indian attempt, its construction depending entirely on the facility for fixing as many piers as you like in the bed of the stream, or pond, or whatever it is. In this case the curved form of the roadway appears to have been chosen purely from a desire for the picturesque; there can be no question of headway for boats, for the waterway is in any case barred by the longitudinal ties, and it would have been both easier and cheaper to keep the bridge roadway level. But the Japanese are a nation of artists, and are prepared to make practical sacrifices for the sake of picturesque effect; yet whether that fact shows them to be a more enlightened or a less enlightened nation than ourselves is a question I will leave to the meeting. The two next examples, the covered bridge at Schwyz and the well-known bridge at Lucerne, should, perhaps, not properly have come into this section, for they are really wooden girder bridges laid across the heads of stone piers, exactly on the same principle as many modern railway bridges, but they are timber

structures, and therefore I included them in this section, as we shall not have any timber structures in the other groups. We consider these structures picturesque because they are old and made of timber; we say that a construction on exactly the same principle by the modern engineer is not picturesque, because the girder is made of steel instead of timber. Is that rational, or is it only a prejudice of association? A question I will also leave to the meeting.

The next is the Barton Aqueduct on the Manchester Ship Canal, and here I think we must charge the jury against the engineer. It is a small structure; it might have had character and picturesque effect with no additional expense, and have done its work equally well. It has no character; an architect might have given it some; we have only to look at Mr. Ernest George's two little drawings of wooden bridges, which are hung up in the room, to see that. The next example, a bridge on the Manchester Ship Canal, is open to some extent to the same criticism, though it is better than the last one, and the manner of seating it on the bank is rather effective. We next have the trestle viaduct on the Great Western Railway in Cornwall, which is a striking example of the picturesque effect of a totally unornamented timber structure; nevertheless, it is doomed. It requires constant inspection (I was even told that there was a man on the spot to keep an eye continually on its behaviour under the passage of trains), and it is quite certain that no railway engineer in this country will ever put up such a structure again. The next example is a timber trestle bridge, or it might rather be called an embankment, in Canada. Whether you call that picturesque or not I do not know; it does not appear so to me; it looks untidy and wasteful of material, and suggests the idea of being a temporary scaffolding for erecting something, rather than the erection itself, and it is certainly a very dangerous kind of structure for a railroad, owing to its liability to fire from coals shot from the engine. The next example, also from Canada, is more purpose-like; it appears, as far as I could make out from examining the slide, to be an iron lattice girder carried on wooden trestles, which is not very satisfactory, but is at all events not so wasteful of material and labour as the last example. We now come to a more scientific piece of modern European engineering work, an iron lattice girder bridge near Fribourg. This is a piece of simple and unaffected tie construction, without the slightest pretence at ornament of any kind; its effect is no doubt very much helped by the masonry bases to the piers, which give it a more monumental character than it could otherwise have. These piers are treated quite plainly, and merely bevelled off at the top. I consider such an erection illustrates favourably the argument that perfectly frank display of structure in engineering works, with no pretence at ornament, is not offensive to picturesque effect; at all events I cannot regard a structure like this as an injury to the landscape. The same remarks apply to the Crumlin Viaduct, a structure of the same class. Lastly we come to the great trestle bridge of the modern era. Whether the Forth Bridge is or is not an ugly thing is a point on which there may be a difference of opinion. The first time I saw in an illustrated paper a view of it as it was intended to be, I own I was fairly startled at the aspect of those three colossal humps of construction. Afterwards we got to be so much interested in the problem, and so much impressed by the enormous scale of the work, that the mind became reconciled more or less to its rather portentous appearance. Its great defect, from an æsthetic point of view, is that unless you compare it with a train moving over or a ship passing under it, there is nothing to give scale to it, and you only realise the size when you get quite close up to it. As to its spoiling the landscape, there is not much to spoil just there; the bridge is at all events more interesting than the banks. Probably it will be viewed in different lights according as people know anything about construction or not. Those who do, regard it with interest; those who do not, probably with some bewilderment. As to artistic or decorative treatment, any attempt

at that in a work of this kind would have been preposterous, and would have defeated its own ends.

Coming to the arched masonry type of structure, the aqueduct at Segovia illustrates what I was saying before as to the purely utilitarian character of these structures. The small mediæval bridge—an example in Monmouthshire—illustrates much the same thing. The ribs or groins which add so much to the effect of the arch are an element of the picturesque to us; they were not so to the man who built them—it was the accepted manner of building an arch then. The Pontypridd Bridge is a curious example of what was probably regarded as a bold attempt to span the stream with one arch, at the cost of a very heavy gradient. A modern engineer would do it with a horizontal girder, and would be abused for spoiling the scene; but how could he do otherwise, for what Rural Authority would pass such a gradient as that nowadays? The Berwick-on-Tweed Bridge is a good example of the simple form of late mediæval arched bridge—at least, the piers and the corbel-table are mediæval; the arches rather look as if they had been re-turned and refaced at a later period. The Balcombe Viaduct is a fairly good modern counterpart to this. Brunel's brick one-arch bridge over the Thames at Taplow is a fine piece of construction very simply treated, the order of pilasters on the piers giving a kind of emphasis to their vertical lines, which forms a good contrast to those of the arch. Then we have Kingston Bridge, London Bridge, and New Putney Bridge, all very fine structures, and all of which have this quality in common, that they are treated with the greatest breadth and simplicity, relying for their effect entirely on the disposition of the masses of masonry, not even indulging in the use of an order on the piers, which has been a common and in some cases unobjectionable method of decorating the piers of a bridge, though it is really not in place in such a position. But considering how often architects have applied the order in an illogical manner for the purpose of constituting a decoration, we are hardly entitled to criticise the engineers for doing the same.

Taking bridges in which masonry is used in combination with iron construction, we have in the Victoria Bridge over the St. Lawrence a remarkable example of what was suggested before—that a structure built to resist the forces of nature will almost always have character and interest. Here we have simple massive stone piers, which on the up-stream side are carried out in long spurs to meet and break up the ice coming down after the thaws. There is not a particle of ornament, but the piers and the great box girder laid like a beam over them form a most impressive structure, which would only be weakened by any attempt at ornamental treatment. The Menai Tubular Bridge was built amid many criticisms to the effect that it was a thing of no beauty, which would be an injury to the effect of the suspension bridge, &c. Yet this is how Hamerton, one of the most discerning and enthusiastic of art critics, wrote of it some time after:—

> "The whole bridge is admirable as a work of art, though the art is very simple and severe. The long line of tube (which looks like a great beam) is fortunately broken by the piers of marble which are finished above the beam as towers, and the majesty that naturally belongs to a work of colossal size and weight is enhanced by the prudent use of some architectural adornment. The tubular bridge over the River Conway near the castle is less fortunate, because the neighbourhood of a great mediæval building led the architect of the bridge to adopt a castellated style for the entrances to the tubes—a style which might be more or less in harmony with the fortress, but would scarcely in any other situation have been chosen to accompany a bridge which was nothing but two parallel beams."

The tower in connection with the waterworks at the Llanwyddyn reservoir is an example of the same kind of sham mediævalism. It was well intended, but there is nothing appropriate in making a waterworks tower look like a Rhine castle. Somehow engineers seem nearly always to fancy that there is some suitability in castellated and battlemented architecture for waterworks erections.

Among other large erections of the combined masonry and iron class the Tay Bridge is a fairly good example, and the simplicity with which the masonry is treated is commendable. The Saltash Bridge, a most remarkable structure in an engineering sense, fails to some extent in effect, because the piers, though sufficient in reality, are not massive enough in their proportions to balance, to the eye, the heavy lines and proportions of the girders.

Taking examples of suspension bridges, the Menai Suspension Bridge is in every respect one of the most beautiful structures of any kind in England. The simple but massive treatment of the towers, spreading toward the base, is admirably suited to their situation and function. We may realise this the better by comparing it with the Brooklyn Suspension Bridge, where the iron portion is equally good; the slight but visible camber of the roadway line especially adds a great deal to its appearance of stiffness combined with lightness. But the towers are weakly treated in comparison with the Menai towers, and have the same fault as those of the Saltash Bridge—they are not a sufficient balance to the ironwork. But in general we may say that all the things we have been considering hitherto are characterised by simplicity, sometimes showing nothing but the unadorned construction; and where there is something of an architectural treatment, it is of a broad and simple kind and with no gewgaw about it. It is within the last quarter of a century or so that the minds of engineers have been poisoned with the terrible ambition to produce "handsome" structures, and in the endeavour after that have they entered on a field for which their training has in no way fitted them. Now there are occasions when an engineering work may fitly be the subject of ornate treatment as a work of architecture. But it seems impossible to get engineers to understand that the handling of decorative architectural detail is a matter requiring special training, and cannot be done by a mere instinct. And it is in consequence of this unfortunate misconception that recent engineering works are becoming objects of horror and dismay to us. When London and Waterloo Bridges were built, engineers could produce works which were not only useful but grand and impressive. Now they are rapidly ceasing to do this, because they are grasping at something else which is often quite unnecessary, and is at all events out of their range. The two mistakes we most frequently meet with in these ornate modern engineering works are coarseness of design in ornament and mouldings and want of perception of scale. In fact, it appears that engineers hardly realise what scale means, and think that a detail which is good on a small scale is good on a large scale, which by no means follows. *Scale* may be regarded in two lights. It consists partly in so proportioning all the parts and details of a design that they shall have an harmonious relation to one another, that they shall all appear to be parts of the same conception, and not as if they were details culled from buildings of various sizes and illogically fitted together. This is what may be called perception of scale in the abstract. Besides this, there is also what may be called conventional scale: the recognised and habitual proportion to each other of details (such as those of the orders) which have by long use come to have a certain recognised relation to one another, so that a use of one of them on an entirely different scale to what we are accustomed to confuses our sense of proportion in the structure. This sense of scale is conventional and acquired, no doubt; but if these conventional materials of architectural design are made use of at all, they ought to be used with knowledge and not at haphazard. This modern desire on the part of engineers to make ornamental structures, without having ever studied design in the artistic sense of the word, is producing structures of which we have really a right to complain. Compare the present Blackfriars Bridge, with its coarse carving and its great stumpy column totally out of proportion and out of place, with the design of old Blackfriars Bridge, simple and refined in detail, and with an order used on the pier which is at all events in proper proportion to its surroundings, and assists the effect of the whole

design. Compare the Chelsea Suspension Bridge, with its decanter-stopper finials, with the simple grandeur of the Menai Bridge. And for the worst example that could be found perhaps in any engineering work, of coarseness and utter ignoring of scale in detail, take the so-called ornamental treatment of the end of Hammersmith Bridge, with its enormous acanthus leaves on the ends of the girders—things badly enough designed even if they were small, but on this scale so preposterous that they can only provoke laughter.

The Tower Bridge is an example of a different kind; it represents the vice of tawdriness and pretentiousness, and of falsification of the actual facts of the structure. It is stated that the exterior clothing was designed by an architect; he cannot have been a very eminent one, as we never hear his name; it looks to me more like what results from the advertisement we sometimes see—"Wanted immediately a draughtsman; must be an expert Gothic hand"—it is draughtsman's architecture. The exceedingly heavy suspension chains are made to appear to hang on an ornamental stone structure which they would in reality drag down, and the side walls of the apparently solid tower rest on part of the iron structure, and you could see under them before the roadway was made up. All architects would have much preferred the plain steel structure to this kind of elaborate sham. The same kind of spirit is showing itself in the treatment of ironwork; capitals inserted where they have nothing to do with the structure, spandrils filled in with bad Gothic tracery, and so on. If iron is designed on good lines, it will look better in itself without these gewgaws. We could not have a better example of this than the Galerie des Machines at Paris; an iron-roofed structure on the grandest scale, in which there is not a particle of decoration, and yet which is so fine and imposing in its effect that it deserves to be called a great work of architecture as well as of engineering.

Turning to the subject of the proposed Vauxhall Bridge, we will look first at the illustrations of the bridge at Coulouvrenière, near Geneva, which is understood to have given the suggestion for the Vauxhall Bridge design. The Coulouvrenière Bridge is built over the double stream of the Rhone, which here flows in two streams at slightly different levels, one of them wider than the other. For the sake of symmetry, a small arch has been inserted on the wider side, forming the centre span of the bridge, the two wider spans being equal on each side of it. The centre narrow span is emphasised by four columns, two on each side of it above the piers, which may have some symbolical meaning. These have furnished the hint for the row of useless columns shown along the whole length of the Vauxhall Bridge design. The general aspect of the Coulouvrenière Bridge, from a distance, is picturesque, but the details will not bear examination, and in fact, from an architect's point of view, it is a very bad design. The columns have no proper foundations, and are bracketed out over the side of the bridge wall in a very clumsy manner. The decorative details show badly designed *rococo* ornament meandering partly over the surface of rusticated quoins, to which they bear no relation. The archivolts of the arches are strongly emphasised by sham quoins of very pronounced character, executed in cement in imitation of stone. In the Vauxhall Bridge design immense quoins, with a rustication of one foot projection from the wall-face, are carried round the archivolts. The defect of the bridge, in regard to appearance, is that it is unusually thin at the crown of the arch; the concrete construction allows of this, but in facing it with granite the visible arch looks exceedingly thin and weak at the crown. By emphasising the archivolt course by rustication, and at the same time entirely separating it from the spandril masonry, which is kept quite flat, this thin and weak appearance of the visible granite arch is increased; and at the same time the large and deep cornice, of very coarse mouldings, still further reduces the visible depth of the arch at the crown. The details show a complete ignoring of scale. The single moulding which crowns the plinth of the main piers is nearly three feet in vertical height,

and this magnified moulding operates to reduce the whole scale of the rest of the work, making the quoins on the face of the pier, which are really very large, appear trivial. This is an offence against "abstract scale," while the insertion of a necking moulding on the semicircular projection on the face of the pier at once transforms it to a column, of immense thickness and quite out of proportion to any function of a column in such a position. This is an offence against "conventional scale"; but for the necking the projection might have appeared as a portion of wall on a circular plan; the necking transforms it, conventionally, into a column, with the result stated above. The carrying of the cornice round this column, in the guise of a capital, is another architectural absurdity; and, considering that the whole thing is on a raking line, the working of the mitres of all these mouldings, running round the column on a raking line, could only be managed by a system of fudging. In fact, the whole thing is a jumble of incongruous details, put together by some one who does not understand the language of architectural design.

The problem of treating a concrete bridge with a granite facing is, in fact, rather a new one. The granite is here, in reality, only what the French call a *revêtement*. One architect sent me a suggestion that the bridge, being a concrete construction, ought to be left as such, but I think we should all agree that a mere concrete bridge, however "honest," would be a very bald-looking affair. Mr. Mountford had made a suggestion that the voussoir lines should be carried right up over the face of the spandrils and up to the capping of the balustrade, in a flat form, thus giving increased depth to the face of the arch. I have tried the effect of this, in a design purposely kept very plain (fig. 1), not taking the channelling of the voussoir joints, however, up to the capping, but only up to the plinth line of the balustrade, as I think it would be a pity to lose the open balustrade. The object is, you see, to give it a flat appearance, answering to the idea of a *revêtement*; and by omitting any large cornice and introducing only a string and corbel table, to get a greater apparent depth at the crown of the arch; five feet instead of the two feet six inches of the County Council design. The balustrade capping and the string are both stopped against the pier, to avoid raking mitres. The pier is treated on the face as a buttress, and has no rustication, because if the channelled joints of the voussoirs are carried up to stop against the projection of the pier, it is obvious that you cannot emphasise the jointing on the pier, as the two would quarrel with each other. The plain lamp standards, on a pedestal rising out of the curve of the buttress, are in the manner of the ironwork of old Vauxhall Bridge—flat, heavy castings. I am not offering this as what I would carry out; it is a very plain design made *extempore*, I may say, merely to try the effect of that treatment of the face of the arch. The other design (fig. 2) is by my draughtsman, Mr. Curtis Green, to whom I suggested that he should try what he could do with a simpler design on the same lines of arch and parapet as those of the County Council design. He has retained the arch-quoins, but made, I think, a pleasing design. However simple both these appear in comparison with the pretentious character of the County Council design, I do not believe either of them, if originally proposed, would, at all events, have raised any outcry on the part of architects.

Finally, in regard to the general subject of the designing of bridges, I should like to put one question, which will, perhaps, seem a very heretical one to engineers, but which I think is, as Falstaff said, "a question to be asked." If it is urged that, in the case of bridges which are to be decoratively treated, the engineer should be assisted by an architect, why should it not be put the other way about—that an architect should build the bridge, assisted by an engineer? Architects are not familiar with the problems incident to forming foundations in deep water, in the bed of the sea, or of a river; but as soon as the structure clears the water, if it is to be an architecturally treated bridge, it is really more of an architect's business than

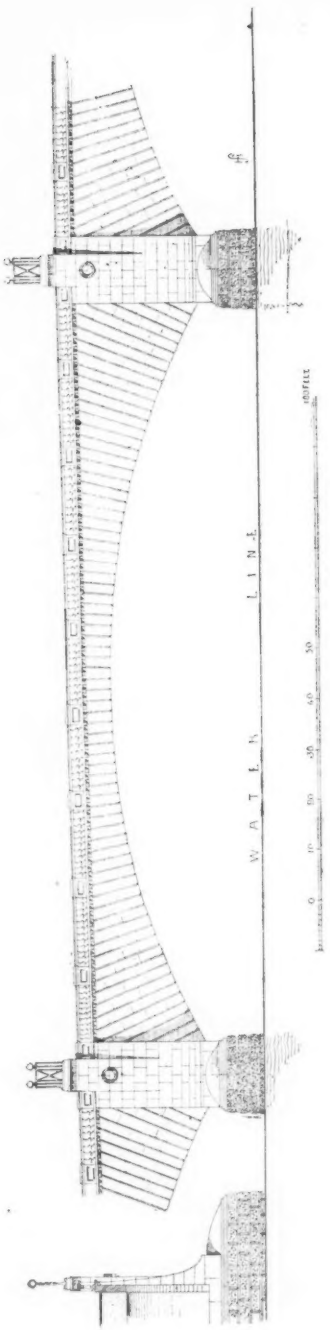


FIG. 1.

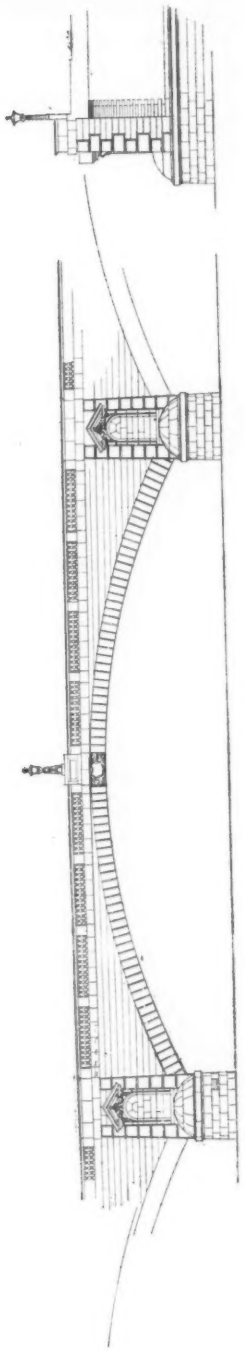


FIG. 2.

an engineer's; and I think it may very well be questioned whether, instead of the authorities saying to an engineer, "Build us a bridge, and we appoint Mr. ——, F.R.I.B.A., to assist you in the decorative details," they should not rather say to an architect: "Design us a bridge, and we appoint Mr. ——, M.Inst.C.E., to prepare the foundations." But I fear that this is throwing an Apple of Discord on the board.

DISCUSSION OF MR. STATHAM'S PAPER.

Professor AITCHISON, R.A., *President*, in the Chair.

THE EARL OF WEMYSS AND MARCH [*H.A.*] regretted that his deafness had prevented him hearing a good part of the Paper. He was, however, in thorough sympathy with the principle, that the design of some of the engineering bridges should have been under some sort of control before being carried out. The Forth Bridge was a wonderful construction, but it had absolutely destroyed the landscape. One of the most beautiful places in the world, belonging to Lord Hopetoun, had a lovely view down the Forth, but the bridge now blocked the prospect. Engineering skill, he thought, should have been able to give all that was required without disfiguring the landscape. The first bridge at Cannon Street might be a good or a bad one, but immediately after it came a girder bridge, which shut out the whole view down the river. Take again the elephantine Hungerford Bridge: nothing could be more ugly. These great bridges, and all public works, had to go through Committees of the House of Commons, whose business it was to decide whether they fulfilled a public want, and the money had to be found. When that had been done the engineer should be under some sort of control—whether the control of the Institute of British Architects, or of some Parliamentary Committee. Before the designs were passed, the matter should be looked into to see that other things were not destroyed by the structures. One matter he felt very strongly upon: there ought to be models exhibited. Models were a necessity, and he thought it was a matter the Institute should take action upon. There was a great chance to do so now in connection with the public buildings about to be erected in Parliament Street and Whitehall. He was not aware that the Institute had made any move in that, any more than they had with regard to St. Paul's. He was perfectly astonished that the Institute did not petition, and move, and do everything they could to save St. Paul's. It had been left to private bodies and private individuals to act in the matter. He hoped St. Paul's had been saved to a great extent, and that all the stencilling and black lettering would now be taken off. Architects' drawings, in his experience, were the most deceptive things in the world. The only safe course was to see everything in model. He had had to build himself, and when he had got a satisfactory design his plan was to have it first modelled in plaster, and then a part of the building was modelled in the actual material one-third the size. This was the practice in France very much more than in this country. The new buildings in Parliament Street were to be put up without any model, and some day they would regret it. He remembered one of the designs tendered for the Admiralty. It included a tower nearly 400 feet high to be put up at the corner of the Horse Guards. The authorities had a model made about 10 feet square of all that part of London. The tower was put up, and it fell, as it ought to have fallen. He had been struggling to get Cromwell put up in model, but in vain He was to be put in a pit, like a bear in the Zoological Gardens, on a very tall pillar. An example of the advantage of setting up a model was afforded recently at the Tate Gallery. A statue was to be erected to Millais, and it was a question whether it should be on the steps or in the garden. A rough model was put upon the steps, but it would not do there. It was put up in the garden, but was found to be much too big—it ruined the building. If it had not been for the model the whole building would have been spoilt. Therefore the Institute should urge that all public works paid for with public money should be put up in model first. As for statues, he did not care whether they were out of public or private money, if they were put up in London they should all go through the same ordeal.

THE PRESIDENT said that before the designs were sent in, he had impressed upon Mr. Akers-Douglas the importance of having models made, and he understood they were going to be made.

MR. A. T. WALMISLEY, M.Inst.C.E. [*H.A.*], said he was sure they were all in perfect sympathy with the arguments Mr. Statham had so ably given, and so interestingly illustrated. There was no occasion for architects to do their own engineering any more than that they should be called upon to do their own quantity surveying. An engineer should seek the co-operation of an architect for his artistic details. An architect had not the inclination frequently in his early studies for that mathematical pursuit which was so essential for an engineer in order to be able to calculate his structures, and not only to put plenty of material in his design but to introduce it in the right place. It needed engineering experience to arrive at the correct data for units and

assumptions in structural calculations. He therefore thought that while engineers should be responsible for the stability of structures, architects should always be called in to do the artistic arrangement of parts. He was pleased with what Mr. Statham said in allusion to many of the structures he had brought before them. With reference to Mr. Statham's allusion to the importance of paint for engineering structures, it had struck him that there was one defect in the Forth Bridge, much as engineers justly admired it, and that was in the adoption of tubular struts, which could not be painted on the inside. If they had been made of open lattice work, as had been adopted in other bridges, they would have been accessible to the painter's brush. There was one bridge over the Thames not alluded to by Mr. Statham which had always commended itself to his mind, and he had no doubt it would to members of the Institute, as a good engineering design, and that was the Victoria Railway Bridge over the Thames near the Chelsea Suspension Bridge. With regard to the Chelsea Suspension Bridge, the towers as they appeared to the public were not true towers—they were patchwork; there was no truth in them. It was an attempt at ornament to cover the true towers, in the same way as was done in the Tower Bridge. But in the case of the Victoria Railway Bridge, if the parapet were examined it would be found an essentially engineering design. It could not possibly be made in masonry, and therefore it was a true iron hand-rail, which commended itself to his judgment as an engineer. Neither architects nor engineers had any right to make any iron structure as necessarily an imitation of either a timber or masonry design. Let them be true, as Mr. Statham had so well pointed out, and then they would attain their object.

Mr. HENRY LOVEGROVE [*A.*] thought Mr. Statham was in error on one point. It was well known that Sir Horace Jones designed the architectural portion of the Tower Bridge; but it was not so well known that Mr. G. Stevenson, who had been for some years his draughtsman, finished the details by order of the Corporation.

Mr. STATHAM said that Sir Horace Jones certainly made the first design, but the design as built was different and very inferior.

Mr. BERESFORD PITE [*F.*] thought they should express their obligation to Mr. Statham for the very interesting lecture he had given them. Mr. Statham, he was sure, had succeeded in carrying conviction to their minds, as in such a subject as this there was nothing so certain as the ocular demonstration that they had been favoured with, in addition to a skilful, discriminating analysis. As soon as they accepted Mr. Statham's fundamental principle that the simple expression of the structural purpose of a building gave it dignity of purpose, and not of necessity without dignity of appearance, they had arrived at a basis of design in most of the problems that presented themselves in the structure of bridges and viaducts. If the engineers would be content with the real greatness of the work they had in hand, further efforts at ornament might be needless. The tendency to ornament was natural to the human being. The savage would decorate himself, and the engineer, proud of his skill, must decorate his building. Architects, however, had to bring to bear on engineers their own personal ideas of the suitability or beauty of ornament, and here came the difficulty. If Sir Alexander Binnie would take up the line with regard to the decorations of Vauxhall Bridge that Sir William Richmond took up with regard to the decoration of St. Paul's, the public would be at an *impasse*, and nobody would be able to tell the one that his ornaments were any worse than those of the other. As a member of the Council, it might not be out of place for him (Mr. Pite) to state that the Institute as a body was not content to leave those things alone. They had been agitating with reference to Vauxhall Bridge, and had been approaching the County Council, and, in spite of some coldness on their part, he hoped that before very long the public would be able to learn that their interference had been beneficial in the interests of ornamental art. He hoped they might be able to apply the governing principle of Greek art to Vauxhall Bridge, and beautify it by a system of elimination into a more beautiful and severe style. They had no quarrel with the designer on the score of construction, although they might have different opinions as to the advisability of casing a plastic material with granite; but, accepting the facts as they were, it was certain that the application of artistic experience to the details would be beneficial. The public protest with regard to Vauxhall Bridge was signed by the President of the Institute, and circulated by the Institute, and that undoubtedly was the most important protest that had been made. He referred to the protest which appeared in *The Times*, and was signed by, amongst others, the Archbishop of Canterbury. Since that date the Institute had not let the matter lie. They had approached the members of the County Council in deputation, and negotiations were going on now, and they had very well-founded hopes that their interference had not been in vain As the noble lord had referred to St. Paul's, he might say that the Institute had not been backward with regard to that. As an Institute they could not publish every step they had taken in the matter, as it would defeat the ends they had in view, but members would be glad to know that with regard to this question they had not been altogether asleep. In concluding he begged leave to move a very hearty vote of thanks to Mr. Statham for his lecture.

Professor KERR [*F.*] thought that the system

of exhibiting illustrations on the screen was delusive to a certain extent. It must be borne in mind that the photographs reproduced on the screen were taken from points of view which suited the artist, and not perhaps the architect. He had listened, however, with very great attention and with very great interest to Mr. Statham's discourse. It was not so academic as he expected it might be, which was all the better. It was very suggestive, and it seemed to him its suggestiveness throughout came ultimately to this, that from their point of view architectural design was a beautification of building; and, if so, why should not a building be beautiful to the engineer? The first principle was that the construction should be correct. The second principle, that that construction should be carried out with an eye to grace. There was no reason why the works of the engineer—more particularly in bridges and the like—should not be rendered as graceful as any of the works of the architect. How was this to be accomplished? A good deal was done in foreign countries. There were examples in various parts of the Continent—in Austria, in Germany, in France—which might have been shown if the lecturer's attention had turned that way; but in Great Britain there was absolutely no example which they could say was up to the mark as an effort to beautify the structure of the engineer. There was no reason for this. They did not insist on the engineer doing it all himself, any more than they asked the decorator to do his part of the architectural effect. For the credit of the nation, if a beginning could now be made by some manifestation of opinion on the part of the Institute and its friends, an opening at all events might be made towards a most desirable result. The mere exhibition of a fine bridge in conjunction with its surroundings was not what he understood the architectural treatment of a bridge to be. The conventional, or, at all events, the high artificial treatment of its construction upon constructive principles and upon conventional principles which had grown up, not in one nation alone but in the general community of nations, from the commencement of time, furnished a volume of knowledge which surely could be applied to engineering works quite as effectually, and quite as effectively, as to the works of the artist. He seconded the vote of thanks to Mr. Statham with great pleasure. He was glad to find that the discussion had so far taken what he considered to be a right course. With regard to his old friend Lord Wemyss's argument as to the preparation of models, it was well known that on the Continent it was a rule to present a model of a public monument of a reasonable size before the public were committed to it. It was a great mistake that nothing of the sort was done in this country. They would not, of course, put up a full-size model of a new building, but there would be no harm, if the Government did not understand drawings—and he understood from Lord Wemyss that they did not—in making a model of the buildings. He was quite sure the Meeting would agree with that.

Mr. WILLIAM WOODWARD [*A.*] thought that most members of the Institute would agree with the general propositions laid down by Mr. Statham with regard to the almost universal ugliness with which engineers covered their structural works. There were two instances where not only the structures themselves were exceedingly ugly, but they tended considerably to spoil excellent views of what were perhaps the most magnificent buildings in the world. He referred to the bridge across Ludgate Hill, which so dreadfully interfered with the view of St. Paul's Cathedral; and to the ugly structure of lattice girders which crossed the Tiber, and which interfered with the view of St. Angelo and St. Peter's at Rome. They must all agree with Mr. Statham's condemnation of Blackfriars Bridge, and he wished more had been said as to the unmitigated ugliness of the Forth Bridge, which no constructive skill on the part of the engineer could minimise. Referring to Vauxhall Bridge and the communications the Institute had had with the London County Council, Mr. Woodward alluded to a joint letter from Mr. Waterhouse and Mr. Mountford after their interview with Sir Alexander Binnie, wherein they expressed their entire satisfaction with the design subject to a few corrections. Considering that expression of approval, he could not understand the action of the Institute in publicly condemning the design of this bridge. Coming to the detailed criticism which Mr. Statham had passed upon the bridge, some part of his paper was devoted to the columns carrying nothing. It was unfortunate that attention had not been directed to what was almost a modern feature of the "high art" architect of to-day in erecting columns which carried nothing. He himself had called attention to the hotel erected in High Street, Kensington, by a very distinguished architect, where they would find columns carrying nothing. He could give a dozen instances of the same kind of thing. With regard to the casing of concrete with granite, they were all aware that one feature in the decoration of the finest Italian churches was the casing of a material with marble. He had never heard any severe condemnation uttered in that room against that principle. Why, if the concrete structure had the merits which Mr. Statham himself admitted it had, it should not be cased with an excellent, durable, external polished surface in the form of granite he did not understand. To his mind there was no objection whatever to it. There might be differences of opinion, but he was certain that when that bridge was erected, if it were erected in the form shown them that

evening, it would not only be a credit to London, but be a credit to Sir Alexander Binnie, the engineer who was constructing it. He thought that the London County Council was not to be blamed for its action in this matter, because it had had several conferences with representatives of the Institute, and if those conferences had not resulted as some of those representatives appeared to desire, he was sure it was not the fault of the London County Council.

Mr. E. W. HUDSON [*A.*], in supporting the vote of thanks, said that, apart from the questions of proportion and ornament in engineering design, one had to consider its fitness to the surroundings of landscape or architecture. In a position of wild and rugged scenery he thought an ordinary notion of appropriateness should prevent a civil engineer going so far wrong as to design a delicate structure or overlay it with useless ornament. But it was otherwise when such works were required in great cities or near historical buildings in town or country. In such cases he thought the architect and engineer should collaborate, and a model be afterwards made to scale, as Lord Wemyss advocated, for consideration. He doubted, however, if either profession cared to admit, so far as designing was concerned, that it needed any help outside its own branch. As an illustration of fitness and want of fitness to architectural adjuncts he instanced Westminster and Hampton Court Bridges. They had been interested in numerous examples shown by Mr. Statham, but he wished to know that gentleman's views as to Mr. Page's bridge at Westminster, where he believed Sir Charles Barry had been also consulted. Mr. Statham objected to castellated forms for bridge piers, but he thought it was the right thing to do to have this structure in the style of the Palace adjoining. It seemed to him, *e.g.*, less incongruous than the adoption in Paris of a classic form of bridge, as the Pont de Jena, Pont Notre-Dame, and others in contiguity to the Gothic buildings on the Ile de la Cité or the Renaissance buildings on the quays. It was an attempt at glorifying a kind of pseudo-Roman empire under the Napoleons. In many things, however, we might take a lesson from the French in regard to public works and design. He thought Mr. Statham rather hard upon Chelsea Suspension Bridge. The curve of its chains was naturally beautiful, and the general effect (perhaps aided by a slight fog, as suggested in regard to the Tower Bridge) was light and elegant, although the detail might not be particularly architectonic. The old Hungerford Bridge was perhaps an honester instance of design. As for the iron bridge at Hampton Court, he thought all architects must feel that it was a blot upon the landscape, and wish that its attempt at Tudor girders could be replaced even by an engineer's bridge, however plain and incongruous it might be. It was a lost opportunity for embellishing a river of which they were all proud. He thought it possible to design a Gothic as well as a classic bridge without its being justly considered a forgery. As regards Vauxhall Bridge design he only hoped in the multitude of counsellors there would be wisdom; but it was a more difficult thing to alter a design than to set to work and make another. This the assured dignity of the London County Council would not permit, to say nothing of the *amour-propre* of the engineer. He did not like the proposal shown by Mr. Statham's sketch for carrying the voussoir joints up to the parapet, and the manner adopted in Waterloo Bridge arches was, he thought, preferable. He was not aware that the bevelled lines of the arch spandrils of the Pont de Neuilly in France had been elsewhere recently adopted. The arris was cut away largely at the haunches, and lightened the spandrils and the whole effect. The idea was partly adopted in the cast-iron facing of New Battersea Bridge, but in that case by a core or concave verge instead of a convex.

Mr. E. W. MOUNTFORD [*F.*] said he had greatly enjoyed Mr. Statham's Paper, and felt much indebted to him for showing the view of the bridge from which the present design for the proposed Vauxhall Bridge was supposed to be taken. It would be obvious to any one looking at those views that Sir Alexander Binnie had been successful in reproducing the objectionable features of that bridge without its compensating good qualities. Looking at the original, one could see at once the value of the immense piers coming between arches of such great span. The two piers of apparently thirty feet in width gave the necessary feeling of strength to the bridge which the present design wholly lacked. That, of course, was not Sir Alexander Binnie's fault. The Thames Conservancy limited him as to the size of the piers, and thus greatly marred the appearance of the bridge. When a Committee of the Institute some five years ago made a design for the bridge, they did not alter Sir Alexander Binnie's design in any essential feature, but they did take the liberty of increasing the size of those piers by four or five feet; and they were told at once that that was absolutely impossible, because the Thames Conservancy had fixed the size of the piers shown on Sir Alexander Binnie's drawings, and nothing larger was possible. That, one had to put up with, but, after all, he had grounds for saying that it was quite probable that the efforts of the Institute towards an improvement in the design might not be altogether lost. Referring to Mr. Woodward's remarks, Mr. Mountford pointed out that the reader of the Paper had not objected to the casing in granite at all. On the contrary, he said he approved of the casing in granite. The granite casing was necessary to preserve the concrete from the

weather and the Thames water. If they could persuade the County Council, as he hoped they would, to remove some of the superfluous ornament, he quite agreed with Mr. Woodward that the bridge would not be a bad bridge. As regards the letter to Sir Alexander Binnie to which reference had been made, that letter was a private letter, and was written with a special object which he was not at liberty to explain now. They simply expressed their approval of the general outline of the bridge, which in their opinion was a very great improvement on the original design. But they did find fault, both in that letter and still more in the interview they had with Sir Alexander Binnie, with what might be called the architectural details—the moulding, carving, and things of that sort. There was very little fault to be found with the general outline, and if they got those architectural details right London might get a bridge of which it need not be ashamed.

MR. W. D. CARÖE [*F.*], M.A., F.S.A., said he should like to express his great appreciation of Mr. Statham's Paper. One of his chief points, a point which it was a great pity could not be brought out more generally with the public, was the question of ornament: to get people, and especially engineers, to understand what ornament is. The simple question was, how far ornament should be used in certain forms of structure. With regard to Vauxhall Bridge, with its columns extending into the air carrying dolphins, the suggestion made at the Soirée of the Architectural Association seemed to him a very good one, namely, that they were intended for drain ventilators. That brought him to consider a little point which came rather near home at the present moment. The London County Council had recently been spoiling the embankment at Chelsea, which was a very fine work in itself and cost an immense amount of money, by putting up columns of about the same height as those columns proposed on Vauxhall Bridge. In this case they were drain ventilators; but obviously if such a thing were a necessity it ought to be treated in the most simple manner. To call attention to it with any ornament was a grave mistake. That was one of the special cases he would point out where it seemed impossible to instruct the engineer as to what was legitimate ornament. He had himself written a complaint to the County Council, and had received a reply that they were "ornamental" columns, and had been adopted by the Bridges Committee after grave and serious consideration. He could only hope that Mr. Statham's Paper would get into the public press, so that the public might learn something useful from it, and how to differentiate between true and false kinds of ornament.

MR. STATHAM, in responding, said that with regard to Mr. Walmisley's remarks as to the difficulty of painting the Forth Bridge inside, that was contrary to his recollection, because he was at the works frequently, and had a distinct recollection of seeing the internal hand ladders for going up the tubes. There were, he believed, small doors provided to get into them. With regard to Professor Kerr's remark that the photographs were delusive, in some respects they were; yet they showed the general character. At all events, one could cook a drawing, but not a photograph. It was difficult to illustrate the subject to a large meeting in any other way. Professor Kerr also asked why should not any work of an engineer be made beautiful? He thought he had given his reasons why in some cases it was almost impossible and a waste of time to try to ornament such work. A railway girder, erected for a purely practical purpose, in which one must consider the shareholders' dividends, was a thing one could not afford to ornament. To attempt to treat it as an ornamental work seemed to him out of place. The structure itself was really not so ugly as people said it was. Such structures had only been in use three-quarters of a century, and people had not had time to get used to them. One speaker had referred to Westminster Bridge, and was kind enough to say he would like to have his opinion upon it. He thought it was a very creditable attempt to make a bridge look well, but it lost its interest as soon as one knew that those apparent arches were not the real construction. They were only a piece of scenery. The elliptical arches which rose from the piers and turned over with very graceful lines were not the real construction; that went behind them. As soon as he knew that, he confessed he felt his respect for the graceful lines very much diminished.

THE PRESIDENT said they were all greatly obliged to Mr. Statham for the very interesting Paper he had given them. He would venture to say a word or two, because Mr. Eidlitz, the well-known American architect and writer, sent a letter which was read at the Institute about a year ago, in which he pointed out that beauty in nature depended always upon the perfection of structure. No doubt, if we were as able as Nature is, the mere fact of solving the particular problem in hand would, as a rule, make it beautiful; but we, unfortunately, had not that excellence or that skill, so that very often we were obliged to try and hide our want of skill with extraneous ornament. That was the way in which engineering works, especially when they were on a large scale, would be made to command the æsthetic admiration of mankind.

MR. C. H. BRODIE, writing on the 16th inst., says:

The discussion last night continued to such a late hour that I was unwilling to prolong it. Otherwise I should have remarked on the subject of the new Vauxhall Bridge that, given that the

design of the structure is to stand, the misplaced, so-called architectural "trimmings" should be shaved off, and the pier projections left for some good groups of sculpture. The colossal lamp-posts above them are ridiculous, and in any case this is not the place for the lights. The lamps should be over the centre of the arches, so as to give an appearance of keeping down the crown of the arch, whilst the light directs the navigator. The huge columns on the face of the piers would be much better away, and the space left for sculpture. If one speaks of a column—a column complete with base and capital, I mean—one instinctively imagines a thing of beautiful proportions. And not only in itself, but with regard to the structure of which it, or they, form a part. Judged thus, how can those on the proposed bridge be allowed to stay? Mr. Statham praised the "happy accident" that gave us Putney Bridge. But even there the engineer tried to spoil the effect. That he did not succeed absolutely is due to the necessarily fine effect of a series of large arches. Where he could go wrong he did, by making the parapet top and bottom an absolutely straight line, meeting in a point over the centre, instead of a line following the curve of a line drawn through the apex of the arches. I saw in the last issue of the magazine *Travel* (a copy of which I am sending Mr. Statham) a photo of a Japanese bridge, such as was shown on the screen, with high segmental arches without the haunches filled in. But in this one the timber struts exist only under the side arches, and not under the centre ones. And the bridge appears to be wide enough for wheel traffic—though possibly only jinrickshas.

MINUTES. XIII.

At the Thirteenth General Meeting (Ordinary) of the Session, held Monday, 15th May 1899, the President, Professor Aitchison, R.A., in the Chair, with 23 Fellows (including 14 Members of the Council), 18 Associates (including 1 Member of the Council), 3 Hon. Associates, and several visitors, the Minutes of the Meeting held 1st May 1899 [p. 378] were taken as read and signed as correct.

The following candidates for membership, found to be eligible and qualified according to the Charter and By-laws, and admitted by the Council to candidature, were recommended for election, viz.:—As FELLOWS, Edwin Arthur Johnson (Abergavenny); George Augustus Bligh Livesay [*A., qualified* 1895] (Boscombe); Edwin Arden Minty [*A.*]; Andrew Murray [*A.*]; as ASSOCIATE, Jasper Wager [*qualified* 1898]; as HON. CORR. MEMBER, Comte Paul de Suzor (St. Petersburg).

A Paper, by Mr. H. Heathcote Statham [*F.*], entitled THE ARCHITECTURAL ELEMENT IN ENGINEERING WORKS, having been read and illustrated by means of lantern slides, a discussion ensued, at the conclusion of which a vote of thanks was passed to the author by acclamation.

The proceedings then closed and the Meeting separated at 10.15 p m.

9, CONDUIT STREET, LONDON, W., 20*th May* 1899.

CHRONICLE.

Elections by Recommendation of an Allied Society.

The following gentlemen, unanimously recommended for membership by the Council of the Royal Institute of Architects of Ireland, and found to be eligible and qualified according to the Charter and By-laws, were duly elected Fellows of the Royal Institute of British Architects at the Council meeting of Monday, the 15th inst.:—

GEORGE C. ASHLIN, R.H.A., 7 Dawson Street, Dublin.
FREDERICK BATCHELOR, 183 Great Brunswick Street, Dublin.
WALTER G. DOOLIN, M.A., 12 Dawson Street, Dublin.
WILLIAM M. MITCHELL, R.H.A., 5 Leinster Street, Dublin.
CHARLES A. OWEN, B.A., 16 Molesworth Street, Dublin.
W. KAYE PARRY, B.E., 63 Dawson Street, Dublin.

The London Government Bill.

In a letter dated 4th May, the First Lord of the Treasury, replying to the Council's request that he should receive a deputation with reference to Clauses 5 and 6 of the London Government Bill, stated that he thought no useful purpose would be served if he received the deputation at the present juncture; but that if later he found occasion required him to see a small deputation, he would be glad to do so.

Owing, however, to the modifications made in Clause 5 in Committee, and the complete withdrawal by Mr. Balfour of Clause 6, there is no present necessity for further action in the matter.

Architecture in the Colonies.

The Paper on South African Architecture, the first part of which was published in the last number of the JOURNAL, is the first of a series of papers which have been promised on Colonial Architecture. The next will probably be on New South Wales Architecture from 1788–1899, by Mr. James Barnet [*F.*], of Sydney, N.S.W.

REVIEWS.

IMAGINATIVE DESIGN.

Arbor Vitæ: A book on the Nature and Development of Imaginative Design, for the use of Teachers, Handicraftsmen and others. By Godfrey Blount. 4o. *Lond.* 1899. [*J. M. Dent & Co., Aldine House, Bedford Street, London, W.C.*]

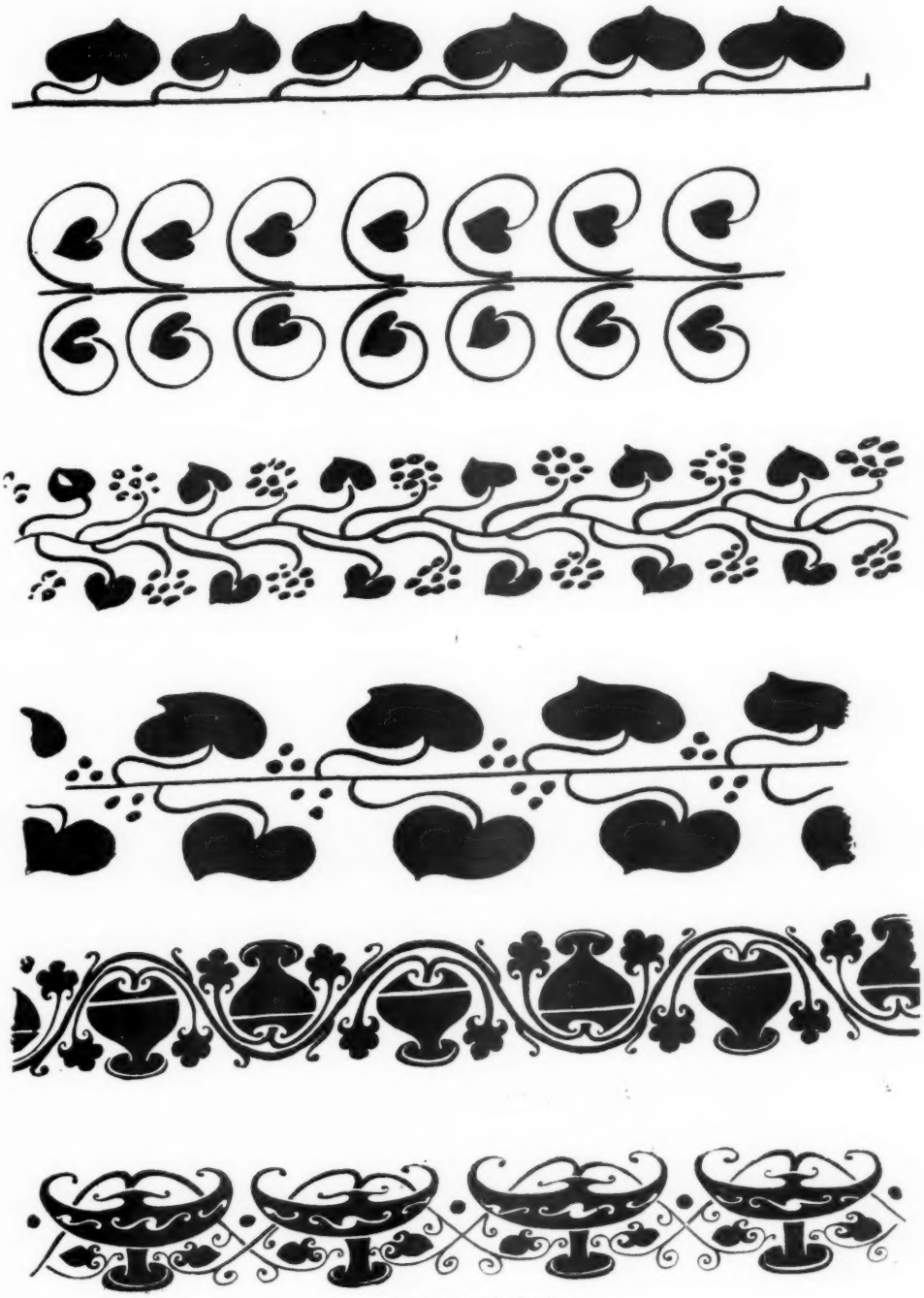
When tradition in art is sound and vigorous it does not follow that because genius is rare good work must be rare also. The power of creative originality is given to very few. On the other hand there are many who are gifted with a keen perception of what is beautiful, and can do good and interesting work while following the sure lines of a living tradition, but who nevertheless would be lost if its guidance were withdrawn. These may carry on their art unaltered in scope, but growing in perfection within its own limits, until a new inventive genius arises who creates fresh fields for his disciples to work in, and causes the tradition to expand, perhaps to gain fresh glory, possibly to end in ruin.

PRIMITIVE CONNECTION OF SPIRAL AND DOT.

In the chaos into which design has fallen owing to the copying of styles whose principles are not understood, and through going directly to nature without the power of translating her meanings into art, the designer has no sound principles to guide him, and no reliable standard for his work. Consequently his designs are more often than not without beauty, without meaning and without simplicity; and the same design is applied without regard to fitness to modelled plaster and sculptured marble, to carved oak and cast iron. Not the least to suffer from our relaxed grasp of traditional principles in design are those arts which minister to our daily needs, and which ought to supply us with things beautiful, however simple, which are a joy to look upon and a pleasure to touch. Any attempt, therefore, to place the principles of design upon a firm basis, and to rescue these everyday arts from ignorance, confusion and indifference, is welcome. In the words of the author, "The aim of this book is to supply a traditional basis for the use of those who are engaged in practising or teaching ornamental handicrafts."

Art, he says, is the combination of traditional symbols as speech is the combination of traditional sounds. Art that is based solely on the imitation of nature is unprincipled art, because principles do not exist in nature but only in the human imagination. All art is the expression of the life of its time. Its language is the universal one of tradition, the common tongue in which Greek, Italian, Teuton or Celt tells his own tale, gives us his own view of things, and the particular feelings that made him Greek or Barbarian. But we must not try to pose as any of these. "No spontaneity is possible while shallow accuracy and blind subserviency to dead ideals is made a *sine qua non* in art. To produce a masterpiece you must shut your eyes to all previous achievements and draw on your own capital of inborn energy." It is only the artist's realisation of what his imagination bodies forth that makes art good, and though that is the greatest art which has the greatest knowledge of things, it is not the knowledge of their forms which makes it great, but the insight into the part in life which these forms play. The essential is to seize the spirit. The swiftness of the hare is more important than the texture of its coat, and the suggestion of the kingly strength and courage of the lion than the likeness of an individual specimen: "the type and not the instance is the artist's love." A spontaneous method is necessary before an imitative one; the abstract and inorganic spiral with spots in the intervals preceded the spiral that threw off leaves and shoots, and when these were added those forms were selected and typified which coincided most nearly with the preconceived idea. The spiral is universal in traditional design. It is the symbol of life and energy. The wind, the waves, and the clouds take its form. The ebb and flow of the tide, the metre of a poem, our very footsteps obey its laws. It must be inaccurate, as nature is inaccurate, or it will give no true picture of life. Following the laws of growth, the abstract spiral gradually becomes more identified with organic objects. It puts forth tendrils, leaves, and fruit, and is then a symbol of the mind of man controlling nature. It widens to a band, and animals course along its path of motion.

DEVELOPMENT OF SPROUTING SPIRAL.



GREEK AND VASE SPIRALS.

Apparently omitted, its controlling force is still felt in the frieze and metopes of the Parthenon. The frieze at its root is a row of spots. These may crystallise into bands of various forms of the rosette or into the triglyph and metope. If the frieze is to express motion, the spots must be of unsymmetrical form, irregularly placed, and all pointing in the same direction—a line of irregular and lopsided ovals. These may be converted into anything we choose: "the flight of birds, the solemn march of geese, the light gallop of deer, or stampede of horses; the triumph, the march, the battle." But their abstract and decorative origin must never be forgotten. We should study the synthetic process of the Greeks, which was the opposite of the present popular one. "The modern method is to construct the whole from the parts. They began with a generalisation, and only admitted details that agreed with their conception of what the whole should be like."

In the same spirit the author proceeds to examine the roots of design in other fields, as the semé, the diaper, and the arabesque, the frame and the border. Only the motive of design claims his attention. The influence of tool and material upon design is mentioned, but is not fully dealt with, it being wrongly regarded by the author as outside the scope of his work. It is of the utmost importance that this influence should be recognised in the present, and it is impossible to over-estimate its effect in the past in controlling, suggesting, and developing the work of the imagination. Proportion in design, so necessary and so often absent, is also excluded. This is a work which, metaphysical by nature and imaginative in treatment, must necessarily contain much matter for argument. That does not render it less valuable or less interesting, for thought stimulates thought. I wish it success in its attempt to help forward that renascence of principle in design which, we hope, is already springing, phœnix-like, from the ashes of the past. J. Humphreys Jones.

NOTES, QUERIES, AND REPLIES.

Early Vaulting at Exeter.

From Professor Baldwin Brown [*H.A.*]—

I am very glad that the Journal has published the drawings by Mr. Harbottle Reed of the curious early vault at Exeter,* which he was good enough to take me to see last year. Is any other example of such a partial use of the diagonal rib known, either at home or abroad? Perhaps, later on, Mr. Reed may be able to give the results of some further examination into the construction of the vault, which is very roughly built. It is worth noting that the diagonal rib seems to have a semi-elliptical curve agreeing with what would be the normal line of a groin, and not the segmental form which Mr. Bilson found in most of the early ribbed vaults examined by him for his recent Paper. With respect to the date of the work, which is ascribed to the last decades of the eleventh century, the scalloped caps of the round central piers need not imply a later period. Though in Normandy they would betoken the twelfth century, they were employed earlier in this country, where we find the cubical cap, plain and subdivided, used in work that is certainly of the eleventh century and may be of pre-Conquest date. The caps of the round piers in the choir at Durham are of the scalloped type, though with fewer subdivisions than at Exeter.

* See plate facing page 345 *ante*.

Cav. Boni and his Restitutions.

From John Hebb [*F.*]—

Strenuous in defending that authenticity in buildings which he once defined as being a necessary condition of their value, the architect Boni from the commencement of his career has carried on a fierce struggle against restorers, advocating instead the restitution to their original position, in the very atmosphere for which they were painted or sculptured, of the many masterpieces now buried alive in the galleries of museums. He hopes to live to see the marbles of Phidias come forth from the galleries of the British Museum and be refixed under the lovely sun of Greece on the cornice (*sic*) of the Parthenon. He hopes that Venice will some day require that Titian's masterpiece be restored to the principal altar of the church of the Frari.

A magnificent thirteenth-century bronze bull fell from the front of the cathedral at Orvieto and was smashed to pieces. A new model for the purpose of recasting it was actually prepared, when, on visiting Orvieto in 1888, the architect Boni saw that it was possible to put the ancient fragments together on a framework. The next year he himself carried out the work, which was completely successful, and the antique bull was restored to its place fifty-five years after its fall.

A worse fate threatened the bronze lion in the Piazetta of St. Mark at Venice, which a misguided multitude wanted to replace; strengthened by an internal breast-plate of bronze, the ancient lion returned more proud than ever to its post of sentinel on the top of the column.

Many years ago the usual restorers, under the pretext of great affection for the building, and the risk of injury from the effects of the atmosphere and light, removed some heads of delicate workmanship from the mosaics of Torcello Cathedral, and sold them clandestinely. The heads were partly recovered, but instead of restoring them to their places they were transferred to the provincial museum of the island. The architect Boni, who is the apostle of legitimate restitution, succeeded in restoring the original mosaics to their places two or three years ago, and as a compensation the museum had copies.—From "La Riabilitazione del Foro Romano," by L' Italico, in *Rivista politica e litteraria*, Rome, Feb. 1899.